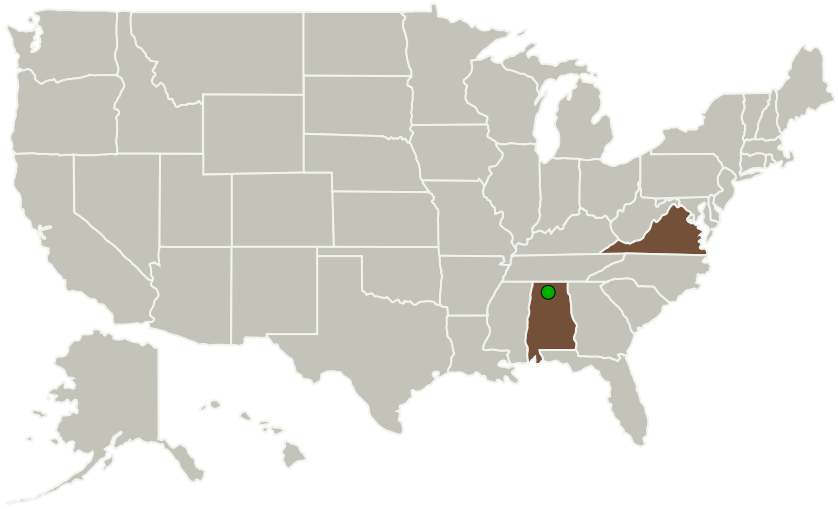
Rapid Fabrication of High Stability Optical Mirror Blanks, Phase I

Completed Technology Project (2017 - 2017)

Project Introduction

Soter Technology is pleased to offer NASA a new technology for manufacturing diffraction limited visible telescope mirror blanks. This technology can support both symmetric primary mirrors and off-axis segments for segmented telescopes. The recurring fabrication cost and cycle time for these mirrors is quite low, once nonrecurring equipment (e.g. the optical test set) has been completed. For example, a 0.25 m diameter mirror with >2 KHz first mode and 19.5 kg/m2 would be fabricated in < 30 days. A 0.75 m diameter mirror with >350 Hz first mode at 21 kg/m2 would be completed in <60 days. The cost of these mirrors (especially at sizes > 1 m) depends strongly on the stiffness requirements, because stiffness drives overall mirror volume. Fabrication costs for the blank and polishing are expected to be between $0.3M/m2 and $0.4 M/m2 for sizes up to 1 m, and <$0.6 M/m2 for sizes up to 2 m. Initial FEA indicates that these mirror blanks will be more thermally stable than ULE mirrors. The goal of these technology is to produce aspheric mirror blanks which can support: - 10 nm RMS global surface figure - 5 nm RMS mid-spatial frequency errors - 1 nm RMS surface roughness This Phase I SBIR will produce and thermo optically test a 100 mm mirror, while applying heat loads representative of those seen by a mirror in a reasonable telescope shroud. In Phase II, this technology will be demonstrated by making a 0.2 m diameter diffraction limited telescope flat field telescope with a 0.2 m diameter primary mirror that is ~20 kg/m2, >400 Hz first mode, 10 nm RMS surface, and has <5 nm RMS midspatial frequency errors.

Primary U.S. Work Locations and Key Partners



Rapid Fabrication of High Stability Optical Mirror Blanks, Phase I Briefing Chart Image

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Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
Soter Technology, LLC	Lead Organization	Industry	Leesburg, Virginia
Marshall Space Flight Center(MSFC)	Supporting Organization	NASA Center	Huntsville, Alabama

Primary U.S. Work Locations	
Alabama	Virginia

Project Transitions

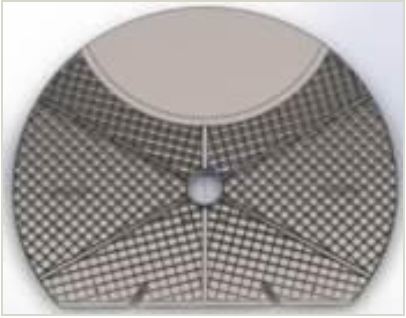
June 2017: Project Start

December 2017: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/140768)*

Images



Briefing Chart Image
Rapid Fabrication of High Stability Optical Mirror Blanks, Phase I Briefing Chart Image
(https://techport.nasa.gov/image/126409)

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
Soter Technology, LLC

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

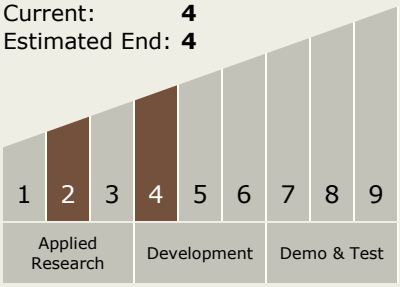
Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
David Strafford

Technology Maturity (TRL)

Start: **2**
Current: **4**
Estimated End: **4**



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Technology Areas

Primary:

- TX08 Sensors and Instruments
  - TX08.2 Observatories
    - TX08.2.1 Mirror Systems

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System